Grid Tie Solar Inverter

Operator's Manual

SG-4000

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

To reduce the risk of electrical shock and to ensure safe installation and operation of Grid Tie Solar Inverter, please carefully read and strictly follow all safety instructions and cautionary markings.

CAUTION — Risk of Electric Shock – Plates are live. Disconnect before servicing.

CAUTION — Risk of Electric Shock , Do NOT Remove Cover. No User Serviceable Parts Inside. Refer Servicing To Qualified Service Personnel.

WARNING — For Continued Protection Against Risk Of Fire, Replace Only With Same Type And Ratings Of Fuse.

CAUTION — To reduce the risk of electric shock and fire – Do not connect a circuit operating at more than 150 volts to ground.

CAUTION — To reduce the risk of electrical shock, disconnect both AC and DC power from the SG series Inverter before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Turning off controls will not reduce this risk. Internal capacitors remain charged for 5 minutes after disconnecting all sources of power.

WARNING — All electrical installation shall be done in accordance with local and national codes ANSI/NFPA 70.

WARNING — Connecting this unit to the electrical grid shall only be performed by qualified personnel and only after formal approval from the utility company.

WARNING — This device contains no user serviceable parts inside. Please return the unit to authorized Service Center for maintenance.

CAUTION — This unit should be mounted on firm background and under a shading roof to avoid exposure to direct sunlight and rain.

CAUTION — Rear heat sink of this unit may exceed 80 ℃ (175° F). Don't touch to avoid risk of burning.

FCC Information to the User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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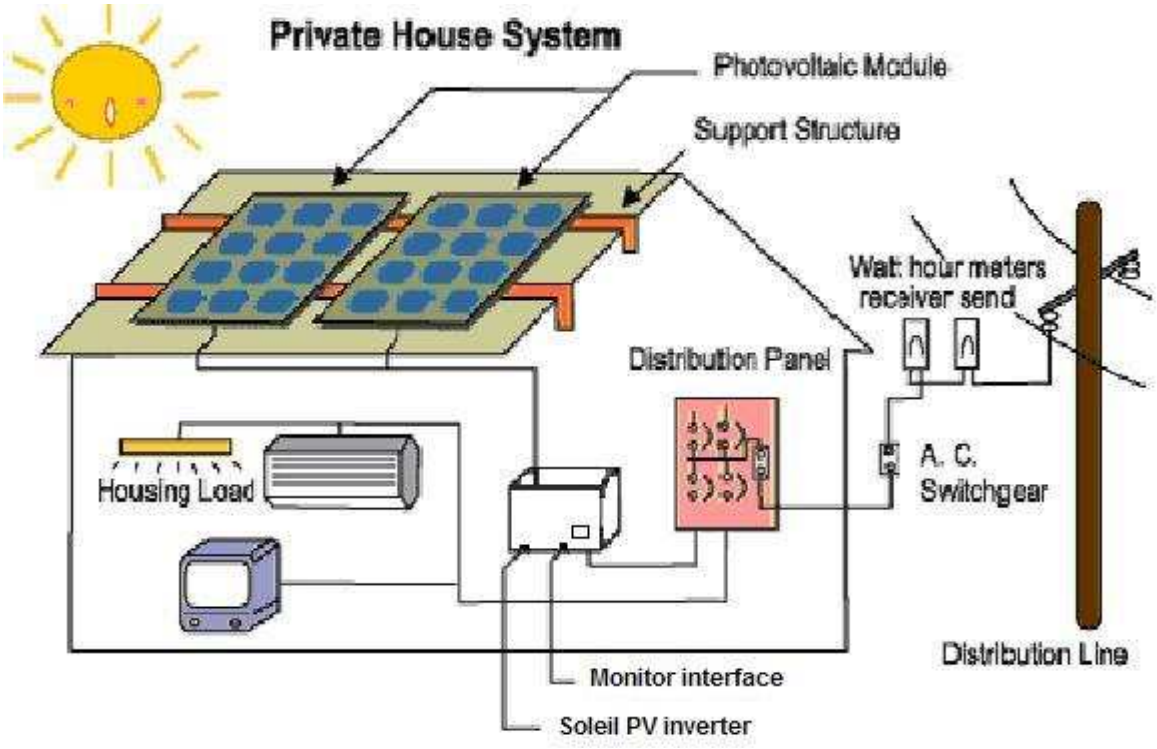
1. Introduction

The system is a two stage parallel circuit photovoltaic inverter. As opposed to traditional photovoltaic inverters, no expensive and bulky batteries are required. Hence, eliminating large expenses on battery maintenance. It can convert photovoltaic DC energy via solar panel modules and inverts collected energy into alternate current, which is then fed directly into the power grid. Such design can benefit from both direct power generating and energy conservation. The control panel adopts Digital Signal Processor (DSP), with the most advanced digital control technology, to increase power conversion efficiency and supplementary functions. Output stage circuit is of single stage with high frequency switchable IGBT. The circuit design has the advantage of being both simple and high efficiency. PV inverter system can be monitored remotely via software. It provides users with convenient power monitoring and recording functions without the need of additional monitoring systems.



2. Installation

Installation

Warning : All electrical installation shall be done in accordance with local and national codes ANSI/NFPA 70.

Warning : Connecting the SG-4000 to the electrical grid shall only be performed by qualified personnel and only after formal approval from the utility company.

✶ SG-4000 can be installed indoor where sufficient air circulation is available with ambient temperature less then 50℃.

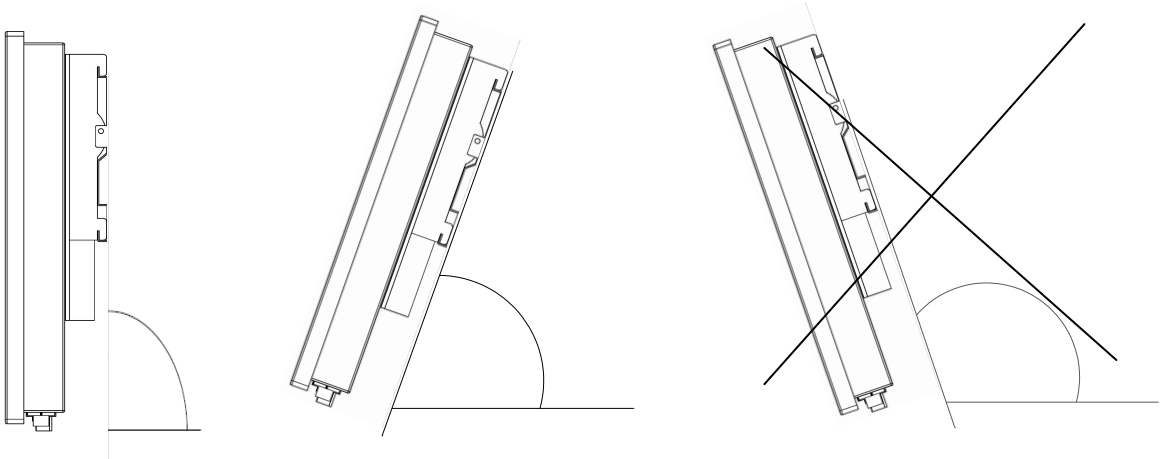
✶ Outdoor installation should be under controlled environment where no direct sunlight would reach, as excessive heating would damage internal components and should minimize exposure to rain despite her high protection class NEMA 3R.

✶ The unit should be installed in a location normally inaccessible to persons.

✶ Avoid mounting on wall of resonant materials like wooden or plastic panels as SG-4000 may slightly vibrate when working under load.

✶ Please install this unit at eye-height (over 1 meter), so that all information and status from LCD display can be read easily. Also please provide sufficient space on both sides of the unit so that Cautions and Ratings would be easily visible.

✶ Mount only on firm background and with correct position as below :



mount straight or tilted to the back

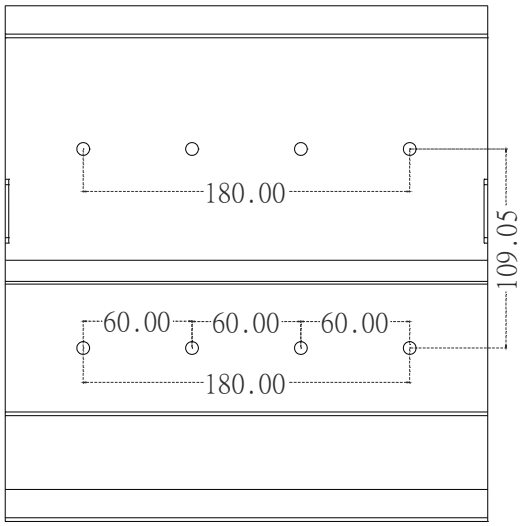
never mount tilted to front

Mounting of SG-4000

✶ Place the metal fixing plate on the designated surface of the wall and mark the holes of the screw.

✶ Drill the holes and hammer in the wall anchors.

✶ Place the metal fixing plate again and fasten the eight screws into their respective holes

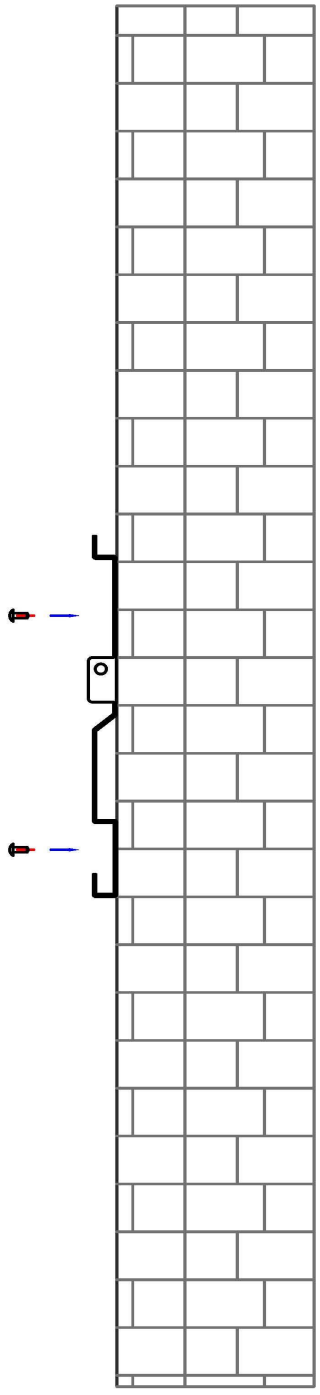


Metal fixing plate

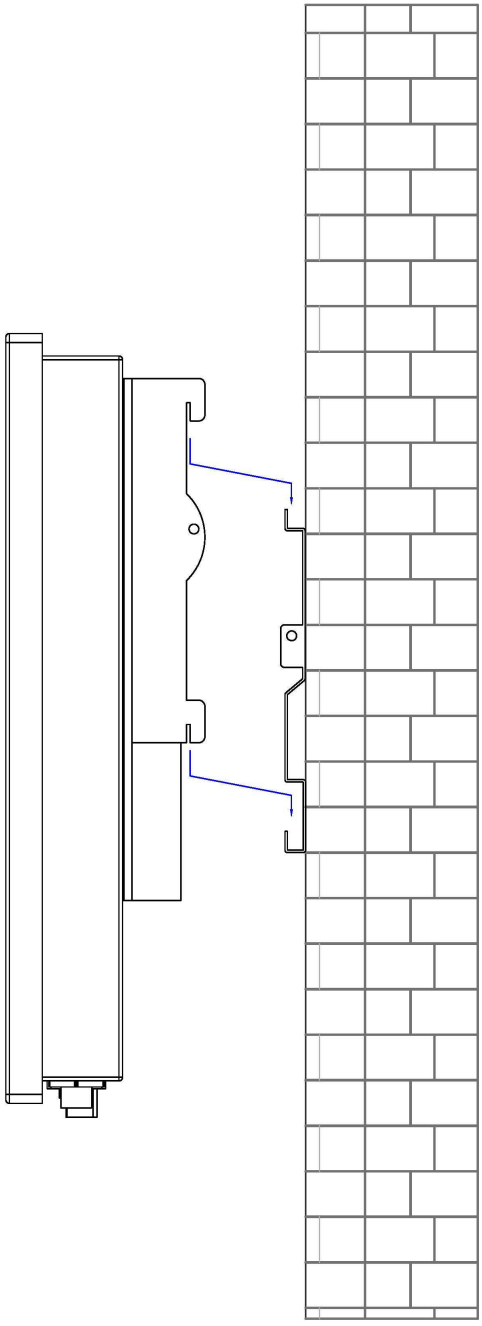
✶ Mount the unit on the fixing plate. Be sure that the four hooks get into their respective fixtures and settle down.

Placement of SG-4000

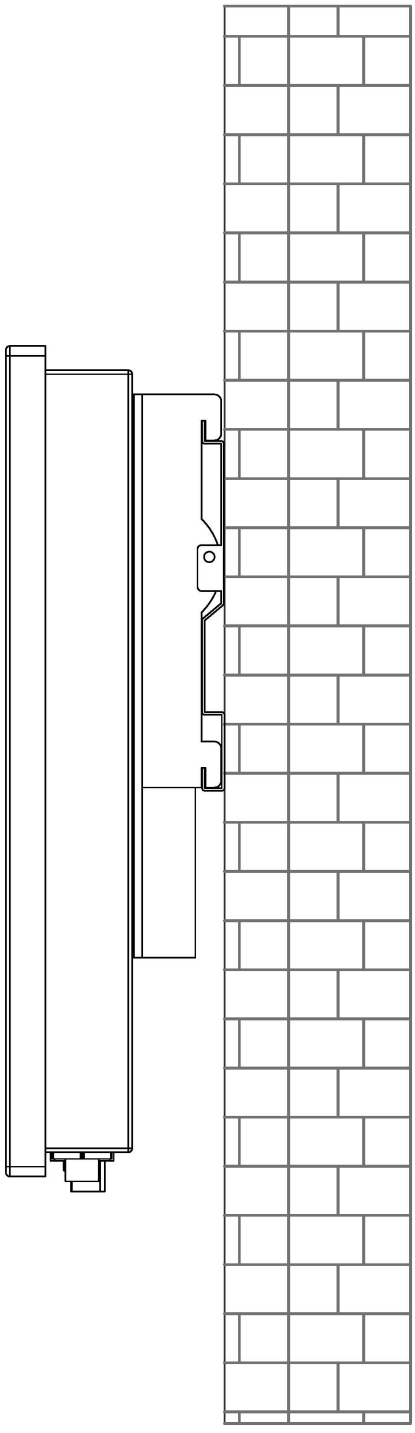
- Step1 : The screws will bracket fixed to the wall.



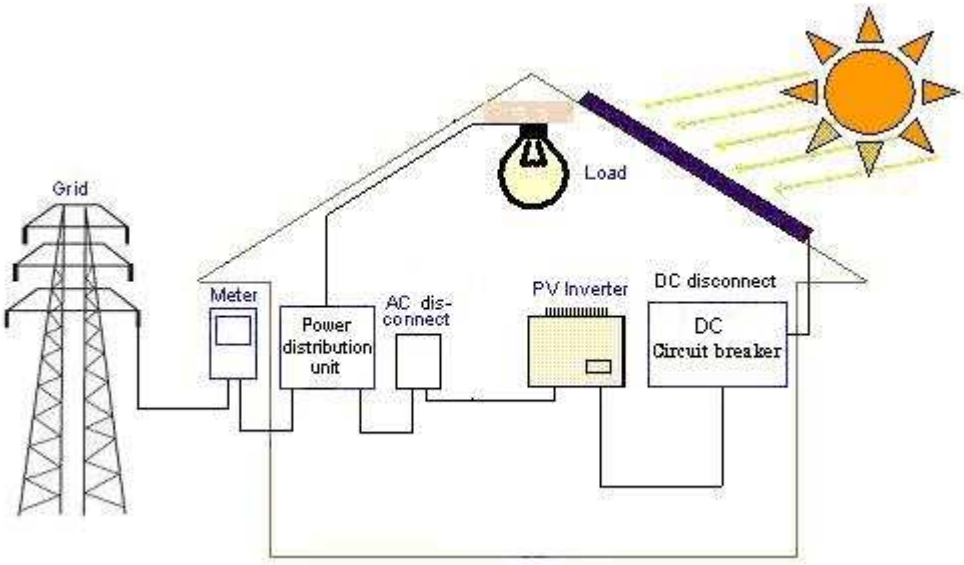
- Step2 : The PV-Inverter are installed on the bracket.



- Step3 : The PV-Inverter bottom side used screws fixed on the wall.



3. Wiring process



The photovoltaic inverter wiring is as shown above.

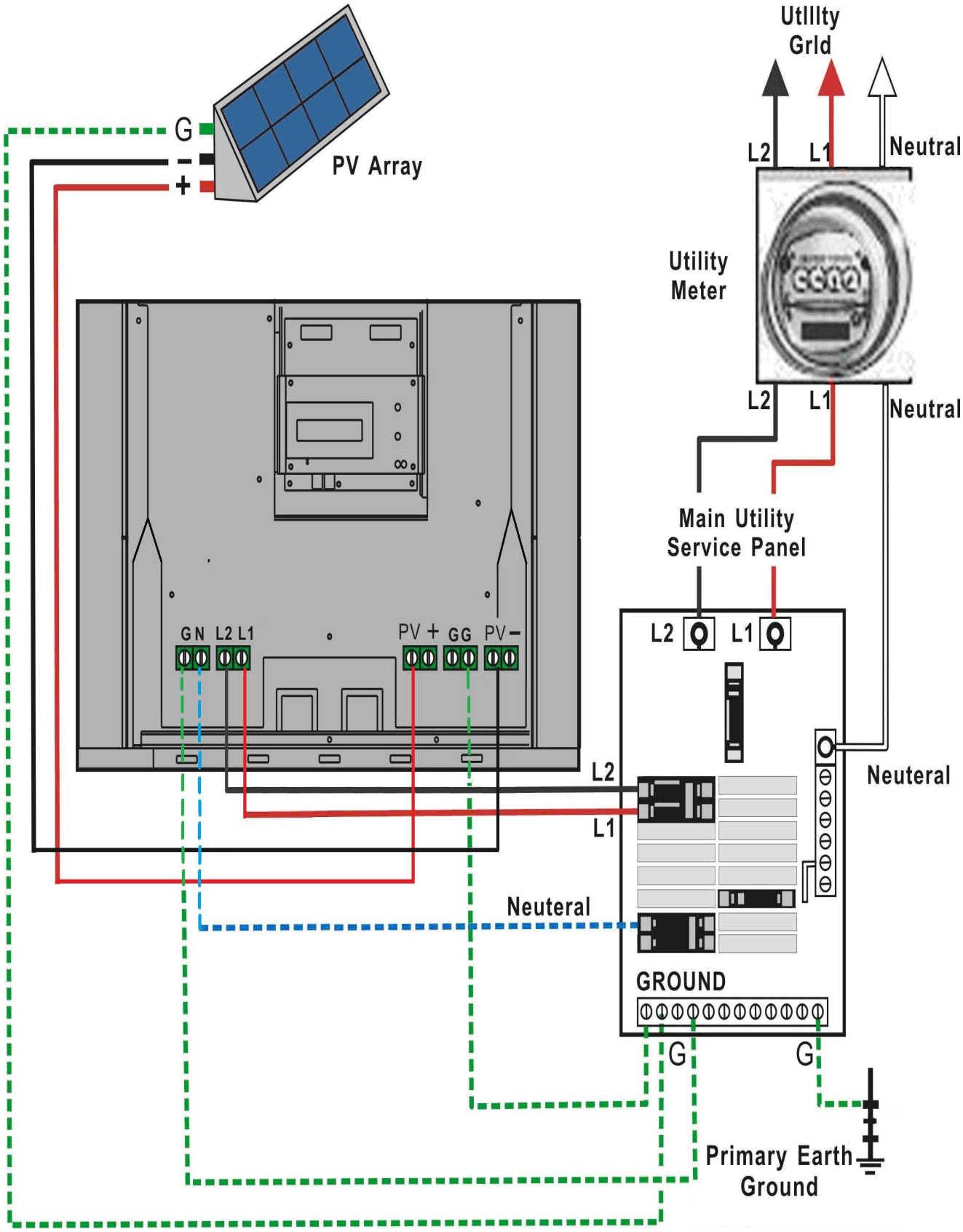
WARNING —National Electrical Code (NEC) requires that the inverter be connected to a dedicated circuit and no other outlets or device may be connected to this circuit. See NEC Section 690-64(b)

WARNING —Follow local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70. Use copper conductors only with minimum 12AWG , 105℃ , 600V wire for power grid and minimum 10AWG , 105℃ , 600V wire for solar panel connections with the PV-Inverter.

Power cable selection:

- **AC wire:** Black copper wires of 12 AWG or above should be used for alternate current output.
- **Ground wire:** For enclosure grounding, green or yellowish green copper wires of 12AWG or above should be used.
- **DC wire:** For input to the unit from solar panels, the cross section area is dependent on the length of the wire. Identifiable colored copper wires of 10 AWG or above, for both positive and negative power supplies should be used.

Wiring diagram please see below ~



4. Operation

Start operation

- Verify all breakers are at OFF position.
- Use an electricians' multi-meter to test and make sure that the input voltage at DC disconnect is within the correct range (150-550VDC).
- Check both the voltage and frequency of main power grid is within the normal range.
- Connect the PV-Inverter to the utility by switching on AC Main breaker and AC disconnect breaker.
- Connect the PV-Inverter to PV strings by switching on DC disconnect breaker.
- After switching on the system, the PV-Inverter will start boot up sequence. It will take a five minutes to complete the self-test cycle, as well as confirmation of power grid voltage and frequency.
- After confirming the AC voltage is within the correct working range, sunbeams can start generating electrical power for user's household electrical appliance and excess power will be fed to utility grid automatically.
- PV-Inverter start completed after a period of time will be automatically converted to sleep mode(LCD display turn off). Knock one time at the front panel can wake up unit.

Power On Screen

2000 01/01 00:00 SG-4000 VER 1.00	Power on screen 1, show the date and model name.
SG-4000 240V Vs=240V F=60.0Hz	Power on screen 2, show the model name and grid status.
SG-4000 240V PV=300V DCV=370V	Power on screen 3, show the model name and input status.

Count down Screen

Auto - start after 300 sec	Count down 300 sec and start operating.

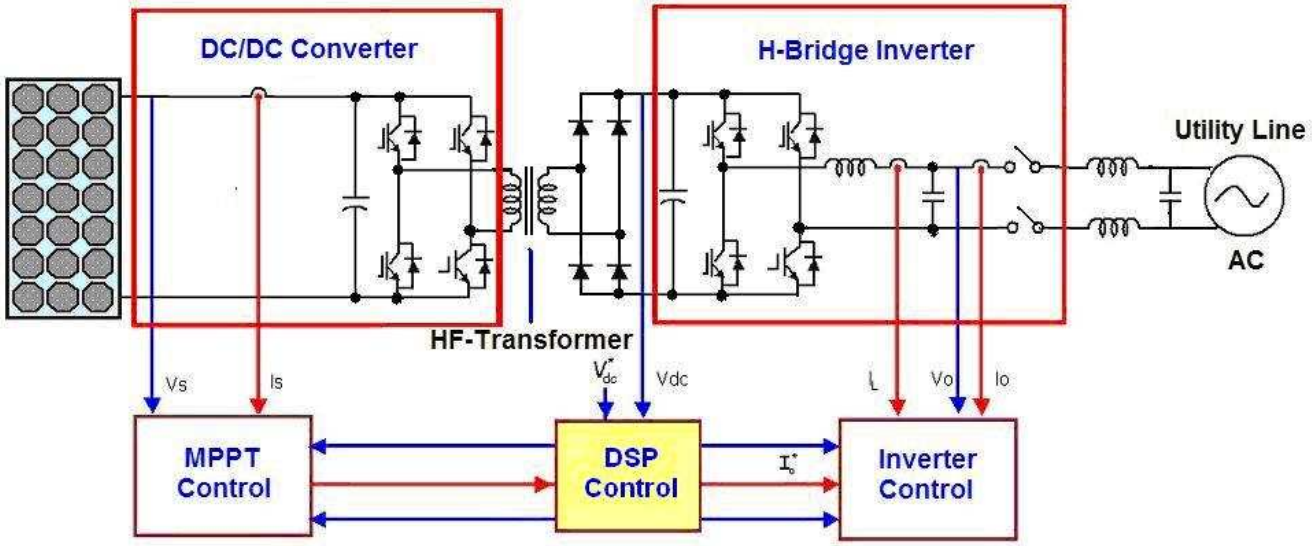
Information Screen

Pin = 2000 W Pout = 1950 W	Show input power and output power.
Total 2.30 kWH Today 1980 WH	Show total generated power and today's generated.
Auto - start after 300 sec	Count down 300 sec and start operating.
2000 01/01 00:00 H TEMP. = 50.0 C	Show the date and the temperature.
2000 01/01 00:00 SG-4000 VER 1.00	Power on screen 1, show the date and model name.
PV=300V PI= 3.0 A Vo =240V Io= 3.3 A	Show the input voltage and current, output voltage and current.

Knock the front panel can change the information display.

5. System structure

- System structure block diagram



System structure can be divided into the following sections:

1. DC/DC Converter:

   A DC/DC converter is a circuit that accepts a solar panel input voltage and produces a DC output voltage to inverter.

2. H-bridge Inverter:

   By using SPWM circuit control technology, the inverter can invert electricity from DC into AC and feeds current into AC grid directly.

3. Inverter control interface:

   The inverter control interface provides control signals including A/D control, I/O control, PWM drive and protection signals. With the support of control interface, users can control and monitor and maintain the entire system.

4. DSP control:

   DSP control can rapidly the computing and handle input and output of control signals.

5. MPPT control interface:

   MPPT control interface could let solar panels in different illumination are able to issue the largest power output.

6. Electrical specifications

Capacity	Output Power	4000W
	Maximum Power	4000W
Input	Norminal DC Voltage	300Vdc
	Maximum PV open Voltage	550Vdc
	MPPT Range	180 ~ 500Vdc
	MPPT Range @ Full Load	240 ~ 440Vdc
	Working Range	150 ~ 550Vdc
	System Start-up Voltage	150Vdc
	Maximum Input Current	20A
Output	Operational Voltage	208Vac (183~ 229Vac) 240Vac (212~ 264Vac)
	Operational Frequency	50Hz (49.3 ~ 50.5 Hz) 60Hz (59.3 ~ 60.5 Hz)
	Power Factor	> 0.99 @ full load
	Current Distortion	< 5%
	Maximum Efficiency	> 95%
	Anti-Islanding	Yes

PV-Inverter meets the following requirements:

EMC: FCC Part15 Class B

Safety: IEEE929、IEEE1547.1、UL1741

Protection Degree : NEMA 3R

Acoustic Noise Level: < 40dB@1m

7.Trouble shooting

Problem	Possible causes	How to correct
Frequency error	Line frequency out of range	◎Check the wiring where abnormal? ◎Check the Mains frequency is within the range of the specification?
PLL Fault	No Line frequency signal	
AC Over-Voltage	Line voltage too high	◎Check the wiring where abnormal? ◎Check the Mains voltage is within the range of the specification?
AC Under-Voltage	Line voltage too low	
AC Over-Current	Output current too high	◎Check the output load is within the spec, and not short-circuit?
AC Over-Load	Output power over 4400W	
PV Over-Voltage	PV input voltage over 550V	◎Check the wiring where abnormal? ◎Check the PV input voltage is within the range of the specification?
PV Under-Voltage	PV input voltage under 150V	
PV Over-Current	PV input current too high	◎Check the output load is within the spec, and not short-circuit?
PV Over-Load	PV input power over 4800W	
DV Over-Voltage	DC BUS voltage too high	◎Shutdown this unit and restart !
Over-Heat	The device temperature too high	◎Increase the heat space around in the case ! ◎The machine installed in a cool place !
DC-DC over curr	Converter short current happened	◎Shutdown this unit and restart !
DC-AC over curr	Inverter short current happened	◎Shutdown this unit and restart !
Line offset err	Line offset detected failure	◎Shutdown this unit and restart !
LOW PV voltage	PV input voltage too low	◎Low sun illumination !
Start error	Start operation failure	◎Shutdown this unit and restart !
Ground Fault	Ground fault detected	◎Shutdown this unit and restart ! ◎Check the Ground wiring where abnormal?